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Search for Candidate Objects with the Sunyaev–Zeldovich Effect in the Radio Source Vicinities—galaxies: clusters: general

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Abstract—Based on the data from the Westerbork Northern Sky Survey performed at a frequency of 325 MHz in the range of right ascensions $0^h \leq \alpha < 2^h$ and declinations $29° < \delta < 78°$ and using multi-frequency Planck maps, we selected candidate objects with the Sunyaev–Zeldovich effect. The list of the most probable candidates includes 381 sources. It is shown that the search for such objects can be accelerated by using a priori data on the negative level of fluctuations in the CMB map with removed low multipoles in the direction to radio sources.

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1. INTRODUCTION

A great amount of observation data coming from ground-based and space telescopes make it possible to considerably increase a number of members of small populations of astrophysical objects within stream data processing using the correlation analysis. The Planck mission of the European Space Agency (ESA) is one of space experiments, the analysis of whose data still continues. The total amount of data available for scientific analysis makes several terabytes and requires automated processing, searching, and identifying objects with specified characteristics. Still, some of the objects observed in sky maps are missed in the published catalogs. The problem of incomplete catalogs can be solved with the help of new algorithms and codes sensitive to topological, statistical, and spectral characteristics of multi-frequency maps of space missions. In such a way, it will be possible to increase a number of identified objects in the current catalogs and to carry out cosmological studies using all the available data.

In the last decade, several surveys have been conducted in observational astrophysics which made it possible to improve the accuracy (better than 1%) of measurements of cosmological parameters. The experiments dealing with measurements of inhomogeneities of the cosmic microwave background map at the NASA WMAP [1] and ESA Planck [2] space observatories stand out among these surveys as well as the Baryon Oscillation Spectroscopic Survey (BOSS) [3] being carried out within the study of baryon acoustic oscillations as a part of the Sloan Digital Sky Survey III [4]. Analysis of the data from these surveys resulted in determination of cosmological parameters with an outstanding level of accuracy and construction of a modern evolutionary model of the Universe from the first split seconds of its existence to our days.

The study of galaxy clusters observed due to the Sunyaev–Zeldovich effect [5] in the millimeter and submillimeter ranges and also in the X-ray range in which hot gas radiation is observed and simply in the visible range remains one of top directions in cosmological studies. These studies allow us to trace the evolution of masses of clusters and the features of formation of a large-scale structure of the Universe in various cosmological epochs.

Significant extension of the list of galaxy clusters in the millimeter range is associated with the appearance of multi-frequency measurements of the microwave radiation such as Planck [6], SPT [7], and ACT [8] experiments. First data from the Planck observatory showed that the documented amount

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